BYU research: Making case for cleaner coal power

Researcher: Gasification, though more expensive than burning, has benefits

By Brian Maffly
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Chemical engineer Larry Baxter
(Courtesy of Brigham Young University)

Coal gasification, an expensive but cleaner way to convert coal into energy, will likely become more widespread, potentially offering breakthroughs in curbing emissions that exacerbate global warming and weaning the U.S. from foreign energy, a Utah researcher predicted at a major scientific conference in Boston on Friday.

As regulatory frameworks evolve to address growing alarm over greenhouse emissions associated with coal combustion, gasification will become increasingly attractive on economic grounds, according to Brigham Young University's Larry Baxter, who spoke at the American Association for the Advancement of Science's annual gathering.

"Global warming issues may create gasification's best chance for success," Baxter said of the technology that uses heat and pressure to separate hydrocarbons and biofuels into their gaseous components - mainly hydrogen, carbon dioxide, carbon monoxide and water. "Gasifiers produce a nearly pure carbon dioxide stream that may be more easily captured and stored than most other processes."

And gasification makes it easier to keep other pollutants associated with coal burning, such as sulfur and nitrous oxides, from reaching the atmosphere. Currently, coal accounts for more than half of the nation's and nearly all of Utah's power generation.

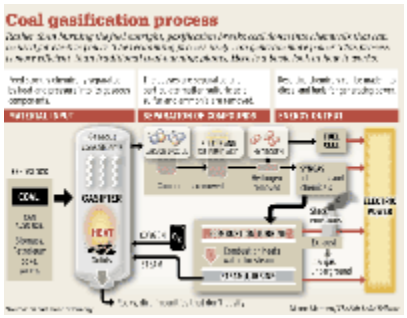
Gasification also can yield transportation fuels in a reasonably efficient manner. A boom in this technology could open new doors for resource extraction in Utah, which holds large reserves of high-quality coal.

In generating power, the process uses the waste heat from gasifying coal to drive a turbine. This technology has the potential to produce electricity with much higher thermodynamic efficiency than traditional steam turbines, but those gains are lost when the technology is used to clean up emissions. Given coal's abundance and the preponderance of infrastructure to produce and burn it, this and other fossil fuels will remain a chief component for power generation, experts say.

"Our challenge is to continue to do that and at the same time reduce the impact of carbon emissions," said Dianne Nielson, Gov. Jon Huntsman Jr.'s energy adviser. "Whatever we do to develop Utah's coal resource, it has to be the best technology in terms of air quality and carbon emissions."

Gasification technology has been available since World War II when Nazi Germany developed it to produce diesel. China, one of the most coal-rich and energy-hungry nations, currently puts gasification to widespread use.

But "gasification has never really found its footing in the



Coal Gasification process (Mike Miller/The Salt Lake Tribune)

U.S. because of problems of implementation and costs," Baxter said. The complex process costs more to build and to maintain than oil refinement for motor fuel or coal-fired plants for electricity. Gasification still faces many technical hurdles, but they can be solved through engineering, he said.

Meanwhile, Europe is pursuing a different "clean coal" technology for power generation called oxy-fuel combustion, in which the coal is burned in the presence of mostly oxygen, outputting a stream of pure carbon dioxide that is easily captured, compressed and injected underground, according to Kevin Whitty, a professor at the University of Utah.

Whitty is "optimistic, but not necessarily hopeful" for gasification's prospects.

"It's getting over that big hurdle of having a few successful demonstration plants," he said.

The main reason gasification has remained on the chalkboard is the unlevel playing field enjoyed by existing facilities, Baxter said. Most of the cost of generating power stems from the construction of power plants.

"That's why we have such old power plants," Baxter said. "Once a plant is paid off the cost of generation goes way down. And the old plants don't face the same regulatory pressure regarding emission standards."

As society puts a greater premium on reducing harmful emissions, however, the cost of conventional power will soar as industry makes new investment to comply with future restrictions, he predicted.

"The rest of the developed world is working on it and is making progress," Baxter argued.

Under current economic models, power produced by gasification costs 30 percent more than the conventional coal-fired model, about 8 cents per kilowatt hour for gasification versus 6 cents for burning coal. Add carbon dioxide capture and storage, however, and the cost goes way up for both models, but the cost differential disappears because gasification simplifies the process of sequestering the greenhouse gas.

"It's still going to be more expensive than current techniques, but it will be cost-competitive compared with most other processes that include CO2 capture and storage," Baxter said. "Coal gasification in the future could become as important as coal combustion is to us right now."